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Title: NDA & NMAC at LANL Overview

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Los Alamos NATIONAL LABORATORY EST.1943

NDA & NMAC at LANL Overview

August 2019

Introduction

- LANL has a long history supporting non-destructive assay (NDA)
  - Hardware
  - Software
  - Techniques
- NDA plays a key role in Nuclear Security under as part of Nuclear Materials Accounting and Control (NMAC)

Historical Figures

Sigvard Eklund, DG of IAEA

Bob Keepin, MC&A Pioneer

Norris Bradbury, LASL Director

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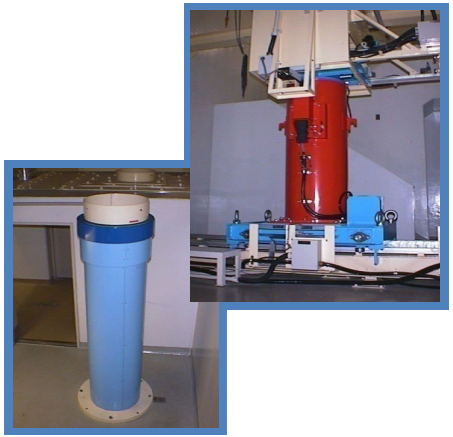
Over 50 Years of LANL Support to the IAEA

- Technology development
- IAEA inspector training
- Staff for rotational assignments in Vienna

Transfer cask at Chernobyl

Training on active neutron coincidence counter



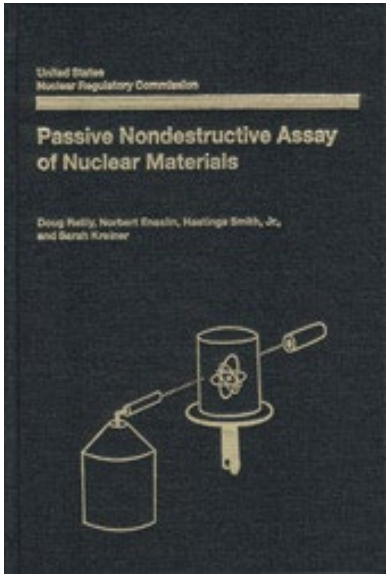
Some NDA Tools Developed at LANL

High-Level Neutron Counter

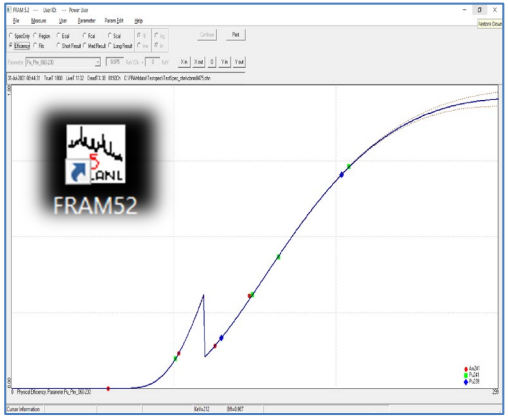
JSR-15

Figure 1 JSR-15/HHMR Prototype picture

The PANDA Manual



FRAM: U/Pu Isotopic Analysis



Cerenkov-Viewing Device

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LANL NDA Training Program

- Domestic training began in 1973
- IAEA inspectors participation began in 1974
- Dedicated IAEA NDA training began in 1980
  - Since 1980 inspectors from every IAEA training class have attended the course
- Courses utilize extensive inventory of nuclear material standards including pure and impure Pu standards, U standards, fresh fuel assemblies, MTR Fuel elements, and MOX standards.
- Since its inception in 1973, LANL has conducted >320 courses, >5600 students, >800 IAEA inspectors

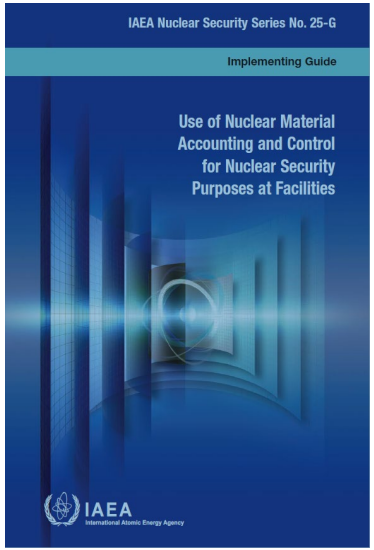
IAEA Inspector Training

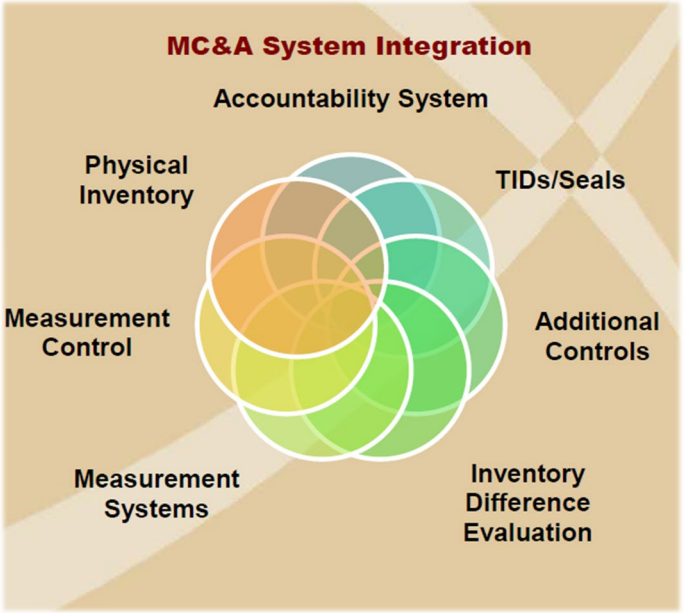
G. Brumfiel, **Nature** 449, 656 (2007)

- Current inspector training course:
  - is a 9 days in length
  - provides fundamental understanding and proper application of gamma-ray and neutron NDA instrumentation used by the IAEA
  - Inventory verification exercise.
- The 48th Nondestructive Assay Inspector Training course was featured in Nature.

NMAC for Nuclear Security

"Both the State competent authority and the operator need to recognize the importance of using NMAC for nuclear security purposes. NMAC should be promoted within the nuclear security culture as an important contributor to nuclear security." (from the IAEA Pub. G25)





IAEA
International Atomic Energy Agency
Atoms for Peace

COURSE AGENDA
International Atomic Energy Agency
INTERNATIONAL TRAINING COURSE
"NMAC for Practitioners"
20-30 August, 2018
Los Alamos National Laboratory
Los Alamos, New Mexico

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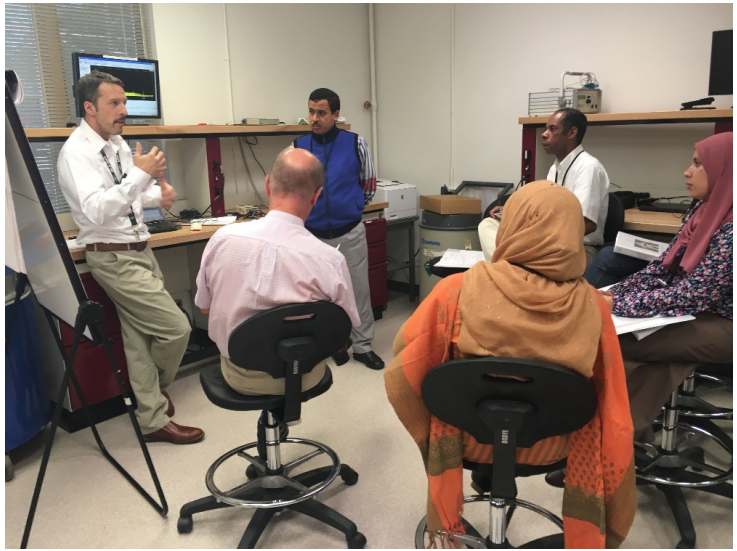
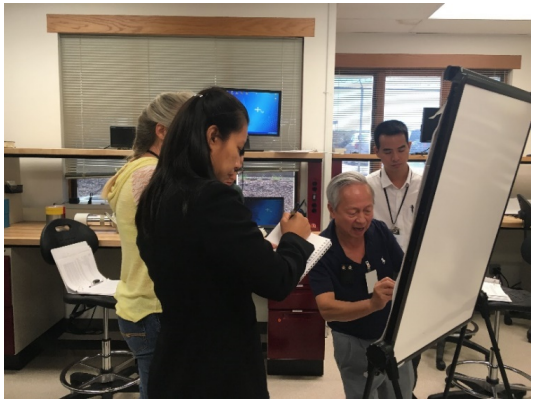
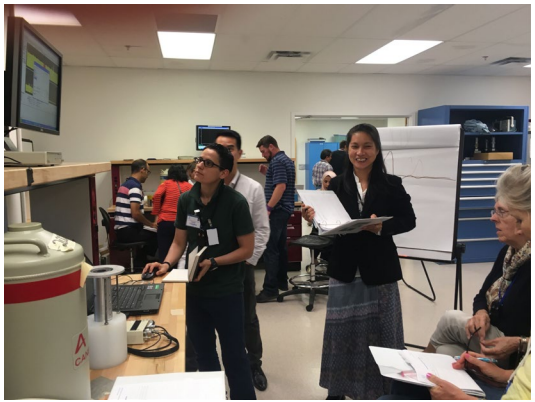
NMAC Training at LANL: Gamma

Participants learn to do gamma-ray measurements for nuclide identification, uranium enrichment, and plutonium isotopic-composition analysis.

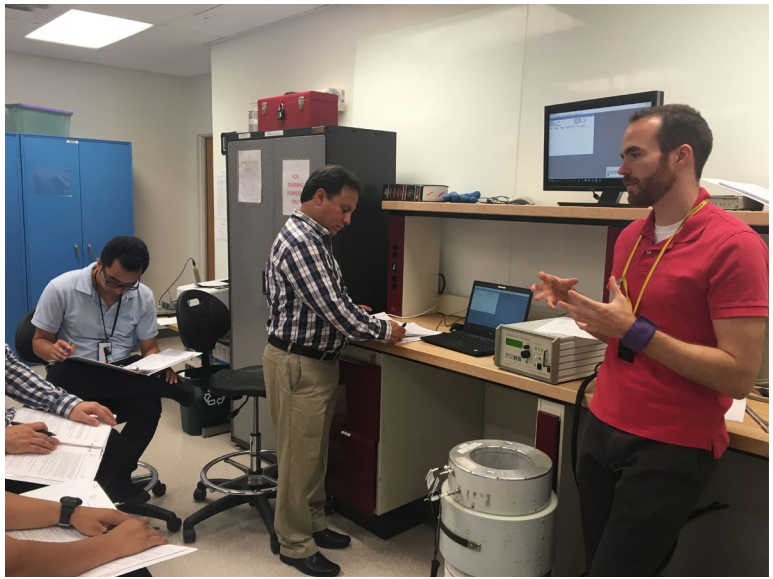






NMAC Training at LANL: Neutron

Participants learn to do neutron coincidence-counting measurements to determine mass of special fissionable material.



Summary

- Los Alamos has a long history of development of tools and methods for non-destructive assay of nuclear materials.
- LANL also has many years of experience in teaching non-destructive assay.
- **NDA** is a key component of **NMAC**
- **NMAC** is a key component of **Nuclear Security**